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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/579,640

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EXAMINER

SRIVASTAVA, KAILASH C

ART UNIT

PAPER NUMBER

1657

MAIL DATE

DELIVERY MODE

11/03/2010

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/579,640	Applicant(s) ROBERTS ET AL.	
	Examiner Kailash C. Srivastava	Art Unit 1657	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 August 2010.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) 1-13 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 14-30 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>06/21/2010 & 08/13/2010</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. The amendment, response and remarks filed 13 August 2010 to the Office Action with Non-Final Rejection mailed 25 May 2010 is acknowledged and entered.

References Cited in 371Application

2. In response to the request by the Examiner to list references/ "Documents submitted with 371 Application" Applicants have complied with 37 C.F.R. §1.98(a) (1) and provided copies of said references so that said references be printed on a resulting patent. Said references are listed on appropriate PTO form(s).

Informals

3. This application contains Claims 1-13 drawn to an invention nonelected with traverse in the reply filed on 25 February 2010. A complete reply to the final rejection must include cancellation of nonelected claims or other appropriate action.

Claims Status

4. According to the amendment filed 13 August 2010, following is the status of the Claims:

- ⌚ Claims 1-30 are pending;
- ⌚ Claims 14, 27 and 29-30 are currently amended;
- ⌚ Claims 1-13 are withdrawn; and
- ⌚ Claims 14-30 are currently under examination.

Withdrawals

5. Considering the Amendments and remarks filed 13 August 2010, the following objections and rejections in the Office Action mailed 25 May 2010 are hereby withdrawn:

- Objection to specification;

- Indefinite rejection of Claim 30 under 35 U.S.C. §112, 2nd paragraph;
- Anticipatory, or in the alternative obviousness rejection of Claims 14-26 under 35 U.S.C. §§ 102(b)/103(a) by Logan (U.S. Patent 6,214, 607 B1) ;and
- Obviousness rejection of Claims 27-30 under 35 U.S.C. §103(a) over the combined teachings from Logan (U.S. Patent 6,214, 607 B1) in view of Venkatesh et al (U.S. Patent 6,066,257).

Information Disclosure Statement

6. The Information Disclosure Statements (i.e., IDSs) filed respectively on 21 June and 13 August 2010 have been made of record, considered and duly initialed sheets of the PTO/SB/08A are enclosed with this Office Action.

Claim Rejections - 35 U.S.C. §103

7. Considering the amendment to Claims filed 13 August 2010, and references provided with the Information Disclosure statements filed respectively on 21 June and 13 August 2010; following are new art rejections to Claims 14-30.

8. The following is a quotation of 35 U.S.C. §103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. § 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR §1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. § 103(c) and potential 35 U.S.C. § 102(f) or (g) prior art under 35 U.S.C. § 103(a).

10. Claims 14-26 are rejected under 35 U.S.C. §103(a) as obvious over combined teachings of Logan (U.S. Patent 6,214,607 B1) in view of Okeke et al (2002. Reduction of perchlorate and

nitrate by salt tolerant bacteria. ENVIRONMENTAL POLLUTION, Volume 118, Pages 357-363., Applicants' IDS filed 08/13/2010, Item 11).

Claims 14-26 are drawn to a method to degrade at least one contaminant present in a contaminated brine stream having "a salinity of \geq about 3%" when said stream is:

- ▲ fed to a bioreactor containing a mixed bacterial culture, wherein;
- ▲ said bacterial culture degrades under anoxic/anaerobic conditions said at least one pollutant in said brine stream;
- ▲ to said bioreactor is also added an effective quantity of a divalent cation precursor in such amount that said divalent cation quantity maintains a divalent to monovalent cation molar ratio at ≥ 0.05 ;
- ▲ said degradation of said brine stream contaminant takes place at a temperature for a duration to bring the contaminant concentration at a desired level, while divalent to monovalent cation molar ratio is maintained at ≥ 0.05 ;
- ▲ said bioreactor is sealed to eliminate/reduce oxygen;
- ▲ said reactor being sparged with an oxygen-free gas selected from nitrogen (N_2) or Argon (Ar) or mixtures thereof;
- ▲ divalent cation selected from soluble salt of:
 - ❖ Ba^{2+} , Ca^{2+} , Mg^{2+} , Sr^{2+} ; or
 - ❖ Ca^{2+} , Mg^{2+} , Sr^{2+} ; or
 - ❖ Ca^{2+} and Mg^{2+} ; or
 - ❖ is Mg^{2+} ;
- ▲ the contaminant is selected from the group perchlorate (ClO_4^{1-}) or nitrate (NO_3^{1-}) or mixture thereof;
- ▲ nutrients comprising an inorganic, or organic nutrient source in an amount greater than a stoichiometric amount of electron required to reduce the ClO_4^{1-} and/or NO_3^{1-} contaminant present in the brine solution for sustained microbial growth;
- ▲ the inorganic energy source is selected from the group H_2 gas, a H_2 delivery chemical or mixtures thereof;
- ▲ the organic nutrients are selected from the group consisting of acetate, ethanol, lactate, methanol, or mixtures thereof; and
- ▲ the contaminated brine solution is a ClO_4^{1-} and/or NO_3^{1-} contaminated ion-exchange

regenerate brine.

Regarding Claims 14-26, Logan teaches degradation of ClO_4^{1-} in a brine solution, comprising per liter of deionized water: 5.85 mg of NaCl, 6.5 mg of MgSO_4 , 4.3 mg of $\text{CaSO}_4 \bullet 2\text{H}_2\text{O}$ and 48.0 mg of CaCO_3 with 100 mg acetate, nitrogen and phosphorus (Example 1; Column 8, Lines 40-45). Logan further teaches that degradation studies for said ClO_4^{1-} contained in said brine solution was carried out in crimp-topped serum vials (i.e., bioreactors), whose head space was purged with N_2 gas, said bioreactors inoculated with ClO_4^{1-} degrading mixed microbial consortium and the degradation was carried out for 7 days at room temperature. In 4 days, 39% ClO_4^{1-} was removed (Example 1; Column 8, Lines 25-40). Subsequently column reactors were inoculated with the same microbial consortium wherein the column reactors contained the same ClO_4^{1-} containing brine solution described *supra* (Example 1; Column 8, Lines 40-45). Logan further teaches that the pH of the column was in range of 5.0-8.0, the column temperature 10 °C to 30 °C to keep bacterial cells viable and active, and the system is comprised of an “oxidizable substrate serving as electron donor. Oxidizable substrates include acetate, ethanol, methanol and hydrogen gas (Column 6, Lines 8-20). Based on the concentrations of each of NaCl, MgSO_4 , $\text{CaSO}_4 \bullet 2\text{H}_2\text{O}$ and CaCO_3 said brine solution has a divalent to monovalent cation ratio of 0.1060. Thus, Lawrence et al., teach each and every limitation: H_2 gas as an inorganic nutrient, acetate, methanol, or ethanol as an organic nutrient, purging with N_2 gas, ClO_4^{1-} -contaminated brine solution having divalent to monovalent cation ratio of 0.1060 (i.e., ≥ 0.05), and 39% degradation of ClO_4^{1-} of the invention claimed in Claims 14-26.

Logan, however, is silent regarding the word brine, wherein said brine stream has “a salinity of \geq about 3%” as required in instantly amended Claim 14.

Okeke et al., teach perchlorate and nitrate removal/degradation in a bacterial culture medium comprising: K_2HPO_4 , KH_2PO_4 , $(\text{NH}_4)_2\text{SO}_4$, $\text{MgSO}_4 \bullet 7\text{H}_2\text{O}$, CaCO_3 , $\text{FeCl}_3 \bullet 4\text{H}_2\text{O}$ and acetate (Page 358, Column 2, Lines 5-11). Okeke et al., further teach that in a comparative study between *Citrobacter* sp. and perclace (ATCC 202172), effect of sodium chloride at concentrations of 0%, 2.5%, 5% and 10% was examined (Page 359, Column 1, Lines 39-43, section 2.4.3). Okeke et al., also teach a contaminant brine stream having 100 mg/L perchlorate in final concentration and further inoculated with co-culture comprising *Citrobacter* sp. and perclace (Page 359, Column 2, Lines 5-11).

It would have been *prima facie* obvious to a person of ordinary skill in the art and one having ordinary skill in the art at the time of the claimed invention would have been motivated to

modify/combine the teachings from Logan with those of Okeke et al., to obtain a method wherein at least one contaminant present in a contaminated brine stream having “a salinity of \geq about 3%” when said stream is fed to a bioreactor containing a mixed bacterial culture, is decontaminated or at least reduced in level of at least one contaminant (i.e., perchlorate); because Okeke et al., teach a contaminant brine stream having 100 mg/L perchlorate in final concentration and said stream further comprises a co-culture comprising *Citrobacter* sp. and perlace, wherein said co-culture reduces the contaminant/perchlorate in said stream. The recited prior art may be silent regarding the exact technique as are instantly claimed, however, since similar steps and same components and principle are described in the prior art references, application of those parameters and steps is deemed merely a matter of judicious design selection of a result-effective parameter which is well within the purview of the skilled artisan especially with the relevant art from the cited references before him/her as a guide (See, e.g., M.P.E.P. §2144.06) and is therefore obvious under 35 U.S.C. §103(a).

From the teachings of the cited references, it is apparent that one of ordinary skill in the art would have had a reasonable expectation of success in producing the claimed invention. Therefore, the invention as a whole was *prima facie* obvious to one of ordinary skill in the art at the time the invention was made, as evidenced by the references, especially in the absence of evidence to the contrary.

11. Claims 27-30 are rejected under 35 U.S.C. §103 (a) as obvious over combined teachings of Logan (U.S. Patent 6,214,607 B1) in view of Okeke et al (2002. Reduction of perchlorate and nitrate by salt tolerant bacteria. ENVIRONMENTAL POLLUTION, Volume 118, Pages 357-363., Applicants’ IDS filed 08/13/2010, Item 11) as applied to Claims 14-26 above and further in view of Venkatesh et al (U.S. Patent 6,066,257).

Claims 27-30 are additionally drawn to a method to degrade at least one contaminant present in a contaminated brine stream having “a salinity of \geq about 3%” when said stream is:

- fed to a bioreactor containing a mixed bacterial culture, wherein;
 - said bacterial culture degrades under anoxic/anaerobic conditions said at least one pollutant in said brine stream;
 - the column resin in said reactor is exhausted, or is not able to remove the contaminant, the flow of contaminant-containing brine is stopped to said reactor, or

fed to a second reactor, while the resin in the first column is recharged with the addition of a divalent cation solution to maintain the divalent to monovalent cation molar ratio at ≥ 0.05 .

Regarding Claims 27-30, teachings from Logan and Okeke et al., have been discussed *supra*. Logan however, is silent regarding switching the reactors or regeneration of column resin.

Venkatesh et al., teach that the units employed in Venkatesh et al.'s method steps have a regeneration zone, wherein the low concentration brine is used as regenerant. Then the waste stream comprising perchlorate containing brine is treated in a bioreactor and the resulting stream is recycled (Abstract). Thus, Venkatesh et al.' method remedies the discrepancy of column/resin regeneration step in Logan's method.

It would have been *prima facie* obvious to a person of ordinary skill in the art and one having ordinary skill in the art at the time of the claimed invention would have been motivated to modify/combine the teachings from Logan with those of Okeke et al., and Venkatesh et al., to obtain a method wherein at least one contaminant present in a contaminated brine stream having "a salinity of \geq about 3%" is decontaminated/reduced with a bacterial co-culture with which said brine stream is inoculated and further a method wherein the column/resin incapacitated of removing the perchlorate contaminant from the brine would be regenerated; because Okeke et al., teach a contaminant brine stream having "a salinity of \geq about 3%", 100 mg/L perchlorate in final concentration and said stream further comprises a co-culture comprising *Citrobacter* sp. and perlance, wherein said co-culture reduces the contaminant/perchlorate in said stream, and Venkatesh et al., teach regeneration of columns/resins and re-feeding the perchlorate-contaminated brine to said regenerated columns/resins. The recited prior art may be silent regarding the exact technique as are instantly claimed, however, since similar steps and same components and principle are described in the prior art references, application of those parameters and steps is deemed merely a matter of judicious design selection of a result-effective parameter which is well within the purview of the skilled artisan especially with the relevant art from the cited references before him/her as a guide (See, e.g., M.P.E.P. §2144.06) and is therefore obvious under 35 U.S.C. §103(a).

From the teachings of the cited references, it is apparent that one of ordinary skill in the art would have had a reasonable expectation of success in producing the claimed invention. Therefore, the

invention as a whole was *prima facie* obvious to one of ordinary skill in the art at the time the invention was made, as evidenced by the references, especially in the absence of evidence to the contrary.

Conclusion

12. Applicant's amendment (i.e., the limitation, having "a salinity of \geq about 3 %") necessitated the new ground(s) of rejection presented in this Office action. **Accordingly, THIS ACTION IS MADE FINAL.** See MPEP §706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR §1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR §1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

13. No Claims are allowed.

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Kailash C. Srivastava whose telephone number is (571) 272-0923. The examiner can normally be reached on Monday to Thursday from 7:00 A.M. to 5:30 P.M. (Eastern Standard or Daylight Savings Time).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's Supervisor, Jon Weber can be reached at (571)-272-0925 Monday through Thursday 7:30 A.M. to 6:00 P.M. The fax phone number for the organization where this application or proceeding is assigned is (571)-273-8300.

Any inquiry of a general nature or relating to the status of this application or proceeding may be obtained from the Patent Application Information Retrieval (i.e., PAIR) system. Status information for the published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (i.e., EBC) at: (866)-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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